Basic Lab Considerations:

1. Set up

a. For this lab, students will need the following materials per group: 6 test tubes, a test tube rack, 1 10-20ml graduated cylinder, test tube holder, stop watch(optional), trays for all student materials to be placed on. For the entire class, you will need fresh beef liver, pH buffers (3, 7, 10 or near equivalents), 3 250ml beakers for the pH buffers, 2 500ml beakers for the hot water and ice bath, hot plate, 2 thermometers, Hydrogen Peroxide.

b. Students will be able to work in groups at their desks or lab benches. For the ice and hot water baths, place them on a sturdy table near the front of the room where every group can easily access. The pH buffers should be on a table or cart at the front of the classroom and be labeled with which pH buffer is in the beaker.

c. Labels should be affixed to the pH buffer beakers and the hydrogen peroxide bottle clearly labeled in a central location. You can also use an index card or sheet of paper and label the ice bath and hot water bath stations.

d. Students will not require a whole lot of room to carry out this experiment, standard lab bench space should be sufficient.

2. Material distribution

a. Students will need copies of the lab instructions/worksheet, 6 test tubes, test tube holder, test tube clamp, stop watch (optional), and a tray.

b. At the start of the lab, the students will receive their trays along with all of their materials except for the pH buffers and hydrogen peroxide which can be obtained from the front of the room.

3. Pre Lab

a. Students will be expected to actively participate in the lab by working through the experiment and asking questions when they need clarification. Students will be able to understand how environmental factors can affect the properties of enzymatic reactions. Students will be experimenting today to explore different environmental conditions on the reaction rate of the enzyme catalase.

b. Safety glasses must be worn at all times during the lab since some of the materials are irritants and there will be heated glassware, which can increase the chance of glass breakage.

c. Students will be given approximately 35-40 minutes to complete the lab experiment. Students will be using catalase to break down hydrogen peroxide under different set ups. One set up will be just the catalase and hydrogen peroxide, two will be testing the reaction at different temperatures (one hot, one cold), and three more under different pH levels.

d. If the lab is not completed in the allotted time, have students arrange with you to finish the lab after school or during a study hall if they have one available

e. This lab fits into the ciriculum because it deals with a metabolic process that goes on within cells. Enzymatic reactions are important in cellular metabolic functions in not only creating energy but also eliminating wastes created or introduced into the cell.

f. Students should empty the contents of their test tubes into a designated waste container that should be removed from the classroom at the end of the day by the teacher. Since liver can get rather smelly, it’s best to throw it out as soon as possible, your custodian will love you.

4. Hand outs

a. The procedure will be attached as part of their worksheet packet and will guide them through the lab experiment.

b. Data tables will be located within the lab for students to record their data

c. Students will be asked questions throughout the lab packet as well as during the post lab report. Students will also be asked to explain their results and relate it to real or theoretical issues dealing with enzymatic reactions

5. Assessment

a. The instructor should be walking around and talking to groups during the experiments and observing student reactions. If all the groups are not getting results, there may be something wrong with either the liver or one of the experimental variables and should be corrected as quickly as possible.

b. Students will use their data to assist them in answering questions and help them to make predictions about altering environmental factors on enzyme activity.

c. Students will be assessed at a later date with quiz or test questions that relate to the concepts illustrated within the lab.

6. Post lab

a. During the discussion, students should be probed as to what caused there to be no reaction under certain environmental conditions

b. By having a discussion, you will be able to clear up misconceptions that students may be having or any wrong conclusions students made about what occurred during the lab. Their lab worksheets should also be reviewed to check for student progress.

c. Students should complete the post lab questions and turn them in the following class period.

d. The next day should continue on enzymatic activity or begin covering enzymes, depending on if this lab is used as an introduction into enzymes.